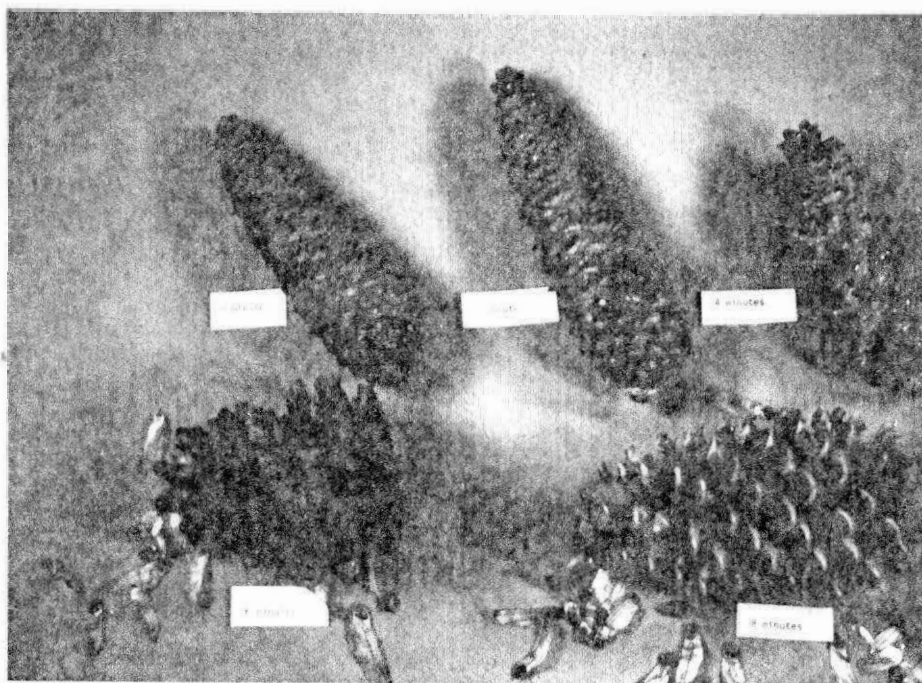


AN EVALUATION OF A MICROWAVE OVEN
TO OPEN GREEN PINE CONES

Larry R. Barber^{1/}

Donna S. Leonard^{2/}



1/ Entomologist, USDA Forest Service, Southeastern Area, State and Private Forestry, Forest Pest Management, Asheville, North Carolina.

2/ Biological Technician, USDA Forest Service, Southeastern Area, State and Private Forestry, Forest Pest Management, Asheville, North Carolina.

INTRODUCTION

Each year, entomologists, working with seed and cone insects, collect and dissect a large number of cones prior to radiography to determine seed quality. One of the principle time delays in this procedure is cone drying. In some instances, there may be delays of up to 2 months while the cones dry.

In the past, the National Tree Seed Laboratory has offered a cone analysis service (CAS) for entomologists and orchard managers. This CAS analysis was used by Forest Pest Management entomologists to determine seed quality in insecticide tests and insect losses in biological evaluations. Beginning in 1982, this service will no longer be available. This means anyone requiring CAS analysis must process their own cones. A fast, efficient system to open cones was needed.

OBJECTIVE

This evaluation was made to determine if a microwave oven could be used to open green, mature, loblolly pine cones and to determine if the extracted seed could be radiographed and x-rays read in terms of seed quality categories-- sound, insect-damaged, empty, etc.

METHODS

A Panasonic microwave oven, Model NE 7830, was used for this evaluation. For each treatment, two green, mature, loblolly pine (*Pinus taeda*) cones were placed in a brown paper bag and placed in the microwave oven for various lengths of time. In all trials, the microwave oven was set on high output.

Treatments

1	No microwave time
2	1 min. high intensity
3	2 " " "
4	3 " " "
5	4 " " "
6	5 " " "
7	6 " " "
8	7 " " "
9	8 " " "

Following microwave exposure, the cones were opened and the seeds extracted and radiographed.

RESULTS

Most of the sample cones began to open after 4-minute exposure and were fully opened at 6 minutes (cover photo). With less than 4-minute exposure, cone opening did not occur. At exposures of 7 and 8 minutes, charring and burning of the cones and seed began. At 8 minutes, small explosions could be heard inside the oven as the seed popped.

A radiographic analysis of the seed from this evaluation, in general, showed small differences between treatments for total number of seed (Table 1). The most variation was found in the category "percent full seed." For example, 92.3 percent of the seed were full in the 4-minute treatment and 72.6 percent in the 8-minute treatment. In the 8-minute treatment, the seed were charred and many could not be extracted whole. Up to the 8-minute treatment, percent full seed did not vary greatly between treatments and no trend was detected. In all cases, except the 8-minute treatment, the x-rays were easily read and seed categories, such as "full," "empty," and "insect-damaged," were easily identified.

DISCUSSION

Extraction of seed from cones is difficult and time consuming work. In this evaluation, the microwave oven demonstrated its usefulness in drying and opening green, loblolly pine cones. Determination of seed quality categories appears to be near normal. The microwave oven method of cone opening looks promising and should be more fully explored. Seed viability after microwave exposure was not tested and remains unknown.

RECOMMENDATIONS

Further work using a microwave oven should be undertaken to determine its usefulness in opening green pine cones of all southern pine species. Various time units and microwave intensities could also be investigated. Another possible use might be to open cones in July or August. This would allow management decisions to be made earlier in the year concerning seed quality and the need for additional insect control. In addition, management might decide that an exceedingly poor seed crop need not be collected.

Table 1
Radiograph Analysis
Cone - Microwave Study
1981 Cone Crop

Treatment	Total # Seed per 2 cones	#	Full %	#	Empty %	#	Seedbug %	#	Misc. %	#	Aborted %
Air dried	278	254	91.4	22	7.9	2	1.1	7	-	-	-
Microwaved 1 min.	199	174	84.4	22	11.1	-	-	1	0.5	2	1.0
Microwaved 2 min.	352	308	87.5	32	9.1	4	1.1	3	0.9	5	1.4
Microwaved 3 min.	296	277	93.6	10	3.4	1	0.3	4	1.3		1.4
Microwaved 4 min.	271	250	92.3	19	7.0	1	0.4	-	-	1	0.3
Microwaved 5 min.	261	221	84.7	20	7.7	2	0.7	-	-	18	6.9
Microwaved 6 min.	230	202	87.8	18	7.8	2	0.9	-	-	8	3.5
Microwaved 7 min.	265	240	90.6	17	6.4	3	1.1	1	0.4	4	1.5
Microwaved 8 min.	296	215	72.6	51	17.3	1	0.3	16	5.4	13	4.4

Gen

Forest Pest Management
Asheville Field Office

Report #82-1-33
August 1982

AN EVALUATION OF A MICROWAVE OVEN
TO OPEN GREEN PINE CONES

Prepared by:

Larry R. Barber
Entomologist

Dennis J. Howard
Biological Technician

Approved by:
for

Charles W. Flaherty
Harvey V. Toko
Staff Director
Forest Pest Management